Beyond GDP: A Welfare-Based Estimate of Growth for 14 European Countries and the USA Over Past Decades

Jean-Marc Germain*

Abstract – Measurements and perceptions of growth are often contrasting and, indeed, GDP growth does not necessarily imply an economic improvement that is felt by the population. In order to quantify this difference, we are developing an indicator of monetary well-being called "Real Feel GDP", which measures, in a money metric, the national average contribution of income to life satisfaction. It offers a retrospective view that is very different from that measured by GDP. For example, in the United States, Real Feel GDP stagnated between 1978 and 2020, while GDP tripled. The gap between Europe and the United States has widened in terms of GDP per capita, but it has narrowed in terms of Real Feel GDP per capita, with countries such as Denmark, Sweden, Finland and France even overtaking the United States. We also see that economic crises last much longer as measured by Real Feel GDP growth, up to a decade, compared to one or two years with the conventional measurement of growth.

JEL: D63, E01, O57
Keywords: economic indicator, welfare economy, inequalities, distribution and beyond GDP

* *INSEE and École nationale des Ponts – ParisTech (ENPC).* Correspondence: *jean-marc.germain@insee.fr*

The author would like to extend warm thanks to Marc Fleurbaey, Didier Blanchet, Fabrice Murtin and the participants of the "Beyond GDP" workshop held in Paris in July 2022 for their useful comments on the preliminary version of the document, as well as the participants of the UN – STATS "Sprint Meeting" in March 2022. He would also like to thank his INSEE colleagues, in particular Sébastien Roux, Jean-Luc Tavernier and Lionel Wilner.

Received on October 2021, accepted on December 2022. Translated from "Au-delà du PIB : une évaluation de la croissance du bien-être monétaire dans 14 pays européens et aux États-Unis".

Citation: Germain, J.-M. (2023). Beyond GDP: A Welfare-Based Estimate of Growth for 14 European Countries and the USA Over Past Decades. *Economie et Statistique / Economics and Statistics*, 539, 3−25. doi: 10.24187/ecostat.2023.539.2095

Does growth contribute to improving well-being? Measurements and perceptions of growth are often contrasting and, indeed, growth, as measured by GDP growth, is not necessarily reflected in the change in standard of living perceived by the population. In order to quantify this gap, we are developing an indicator of monetary well-being, called "Real Feel GDP"**.** The terminology is taken from the meteorological concept of "Real Feel Temperature" and an analogy can indeed be drawn (Blanchet & Fleurbaey, 2020). In the presence of wind, people feel colder than indicated by the thermometer. In order to incorporate this phenomenon, starting in the early 20th century, meteorologists developed indicators of "Real Feel Temperature", originally for polar expeditions (Siple & Passel, 1945; Masterton & Richardson, 1979; Winterling, 1979; Myers *et al.*, 2007). Just as air temperature measured using a thermometer is an imperfect measurement of the temperature felt by the human body, GDP is an imperfect measurement of welfare and this limitation has been known since the invention of the concept. Even when using a monetary approach, various elements that affect the standard of living are taken into account imperfectly, if at all, by GDP.

Initiatives to build an alternative indicator to GDP are not lacking (see Fleurbaey, 2009, for a review). They came back to public debate a decade ago with the Stiglitz-Sen-Fitoussi Commission's Report on the Measurement of Economic Performance and Social Progress (Stiglitz *et al.*, 2009). The Commission believed that due to excessive or inappropriate use of GDP, *"those attempting to guide the economy and our societies are like pilots trying to steering a course without a reliable compass"*. The report called for a shift from a production-oriented measurement system to an approach geared towards measuring the well-being of current and future generations. Here, we propose an indicator along these lines, based on the total level of satisfaction provided by income, rather than on the amount of income. Without going so far as to integrate the non-monetary dimensions of welfare, such as health, social relationships and environmental quality, it takes into account the distribution of income and its impact on life satisfaction.

The rest of the article is organised as follows. After a brief review of the alternative approaches in section 1, we develop the conceptual framework in section 2. In section 3 we present our estimates concerning the link between income and subjective well-being as measured in life satisfaction surveys. Then we calculate Real Feel GDP and examine the comparative changes in our indicator and in GDP for the United States and 14 European countries over the past decades (section 4), before presenting our conclusion.

1. Brief Review of the Alternative Indicators to GDP

The most widely used alternative indicator to GDP is without a doubt the United Nations Human Development Index, conceptualised by Sen & Anand (1994). It is calculated as a (geometric) average of three indices: life expectancy, education level and GDP per capita. More recently, the OECD has developed another composite indicator, the "Better Life Index" (OECD, 2011), based on eleven dimensions that can account for welfare, ranging from safety, housing, income, education, quality of employment, etc. to confidence in government (Durand, 2015). In order to circumvent the tricky question of the weighting to be assigned to each of these dimensions, the weightings are chosen by users. More recently, pushing the multi-dimensional approach to the extreme, Schmidt-Traub *et al.* (2017) proposed an index based on the aggregation of 17 indicators corresponding to the 17 UN Sustainable Development Goals, which are themselves based on a set of 230 indicators, with all indicators having the same weight. Proponents of these indices justify the equal weightings through the equal importance of the underlying public objectives or policies, while opponents, such as Ravallion (2010), view them as "mashup" indices with no theoretical basis.

The second set of indicators comes from the literature on the measurement of economic welfare and was initiated by Nordhaus & Tobin (1973). The main idea is to monetise non-monetary aspects of welfare such as leisure, domestic production, health and education, which are seen as investments that guarantee the sustainability of current standards of living. Later, in the same spirit, Daly & Cobb (1989) introduced the costs of environmental degradation, paving the way for a new generation of indicators known as "green GDP", such as the "Genuine Progress Indicator" (Cobb & Cobb, 1994). This second line of indicators could be described as semi-theoretical, since it relies on economic theory for the principles but does not use it more for the actual construction of indicators.

None of the summary indices invented have taken precedence over GDP and most are no longer used or even calculated. The Human Development Index is one of the few exceptions,

but it remains relatively little used. Government bodies and international institutions are making greater use of more or less extensive sets of indicators, such as the UN Sustainable Development Indicators or the OECD's Better Life Indicators. These help to diversify information, but public debate remains largely dominated by GDP. The need for more relevant summary information than GDP to assess the economic and social performance of countries is therefore still relevant.

Let's start with the obvious. The first possible improvement, and the most evident one, is to relate GDP to the population: the same GDP growth does not have the same meaning in a country where the population is stagnating or declining, as it does in a country where the population is growing.

The second improvement consists in selecting the right indicator of "GDP" from among the different aggregates of the national accounts. The Stiglitz Commission has proposed giving preference to net national income (NNI) per capita. NNI is simply determined based on GDP and is calculated by deducting income paid to foreign residents (net of income received from abroad), as well as consumption of fixed capital, i.e. the share of income needed to maintain the stock of capital year on year, both private and public. As required by the International System of National Accounts (ONU, 2013), net national income is calculated by the National Statistical Institutes (NSIs), but it receives little commentary. One of the reasons for this is temporality. For example, the NSIs of the European Union publish GDP on a quarterly basis in near real time (45 days after quarter-end), while the NNI for year *N* is published in June of year *N*+1 with the national accounts. Publishing an advanced NNI estimate at the same time as GDP would make its use in commentaries more popular.

The third improvement, to ensure an indicator that is more in tune with perceived reality, is to take into account the way in which growth is distributed. If this distribution is very uneven, GDP may well be rising while incomes are falling for the majority of people. The measurement of inequalities has long been restricted to the field of social statistics, based on survey data. The distribution of growth really became a concern for economic performance in the 2000s, when national accountants began to break down household income and consumption by standard of living decile. Although there is a great deal that can be learned from them, these accounts have long been underutilized. They also posed a problem in terms of information on the distribution of the benefits of growth, as household disposable income accounts for only 60% of GDP; switching from category-based accounts to distributed national accounts (DNAs), i.e. a distribution of national income among individuals, required allocating the remaining 40% to households at both the aggregate and individual levels.

National accountants attribute this 40% to companies (which is referred to as "retained earnings") or to public administrations. However these institutional sectors themselves "belong" to certain households or, more precisely, the income they hold goes to them at one point or another. Three advances have made it possible to move towards distribution of 100% of national income and thus towards full-fledged Distributed National Accounts (DNAs) (Piketty *et al.*, 2017; Alvaredo *et al.*, 2016, 2020; INSEE, 2021). The first was the development of a methodology to attribute retained earnings, also known as reinvested earnings, to households (Piketty, 2003; Piketty & Saez, 2003). Work was then carried out to add a monetary valuation of the so-called "individualisable" public services, which are essentially education and health, to the disposable income of households (Zwijnenburg *et al.*, 2021). Finally, distributing all income between households required valuing public services classed as non-individualisable in order to obtain, at the level of each household, an "expanded disposable income" representing the share of the national income that it receives (André *et al.*, 2023).

Extended disposable income is a monetary measurement of standard of living that incorporates many non-monetary dimensions considered essential to well-being, such as education, health, security, social protection, etc. While this is closer to the concept of welfare, this expanded income leaves the question of the aggregated summary indicator unanswered. In this paper, we argue that a weighted sum of expanded standards of living, the weightings of which are based on the contribution of income to improving life satisfaction, is likely to be a relevant indicator of Real Feel GDP.

One promising alternative would have been to build on recent developments in the welfare economy (Fleurbaey & Blanchet, 2013) and, in particular, the concept of Multi-Dimensional Standard of Living (MDSL), developed by the OECD since the mid-2010s (Boarini *et al.*, 2015), following on from the pioneering work of Becker *et al.* (2005), Boarini *et al.* (2006) and

Fleurbaey *et al.* (2009). Rather than attributing to households the book value of public services as is done in distributional accounting, they use theories of welfare to calculate an "equivalent income" to the various non-monetary elements of well-being. The method consists in defining a reference situation for each of the non-monetary dimensions used (for example, being in perfect health) and in calculating the level of income which, associated with that reference situation, would be equivalent in well-being to the actual situation. Formally, for any individual *i*, the equivalent income Y_i^* is the solution to the equation $V\left(Y_i, q_i\right) = V\left(Y_i^*, q^*\right)$ in which Y_i is the actual income, which benefits from a set of non-monetary factors of quality of life q_i, q^* is the reference value of q_i and V is an indirect preference function. The preference function is estimated, based on the study of correlations between life satisfaction as reported in surveys, income and various individual characteristics.

Although intellectually attractive and based on theoretical and empirical developments that are now well established, this method has limitations in terms of fulfilling the function of a summary indicator to be used in the context of official statistics. Firstly, while the statistical link between income and life satisfaction appears strong, this is not the case for major non-monetary dimensions of well-being, such as health. In the most advanced version of the methodology (Boarini *et al.*, 2022), the improvement in life satisfaction provided by an improved state of health is modelled rather than estimated, as Becker *et al.* (2005) and Jones & Klenow (2016) did before. Life satisfaction is examined over the whole life and multiplies current satisfaction by life expectancy, incorporating a factor expressing preference for the present where appropriate. The calculation of equivalent income then requires the use of the "statistical value of a life",[1] which in turn raises technical difficulties such as the acceptability of the values used.[2] Secondly, in order to obtain a national indicator, called the Multi-Dimensional Standard of Living, the authors use a general average of the $(1/n\sum Y_i^{*(1-\tau)})^{1/(1-\tau)}$ type and produce results with three normative values of τ (τ=0.89, τ=3.36, τ=−1.9); with sometimes divergent or even contrasting results, which are instructive in themselves but also leave open the question of which indicator, among the range of possible choices, to use.

Other authors, such as Aitken & Weale (2020), starting from the same objective, argue that the acceptability of an indicator as a reference in the public debate presupposes that it is "simple to explain". They propose a new indicator called "democratic growth" which is calculated as the average of income growth rates, i.e. $\sum \frac{1}{n}\frac{\Delta Y_i}{Y_i}$, in which Y_i is the income of the individual *i* and *n* is the number of individuals in the population. This index is referred to as "democratic", as opposed to growth measured in the usual manner, which can also be written as a sum of income growth rates $\frac{\Delta Y_i}{Y_i}$, but weighted using weightings $\pi_i = \frac{Y_i}{Y}$ proportional to the income of each individual.[3] In effect: $\frac{\Delta Y}{Y} = \sum \frac{\Delta Y_i}{Y} = \sum \frac{\Delta Y_i}{Y_i}\frac{Y_i}{Y} = \sum \pi_i \frac{\Delta Y_i}{Y_i}$.
Democratic growth is intuitively closer to Real Feel growth than to standard growth. However, we would like to do better than set implicitly equal weights $\pi_i = \frac{1}{n}$, especially since the marginal utility of income is decreasing, meaning that democratic growth in a way also amounts to a lower weighting for the well-being of poorer people than for that of wealthier people.[4] The correction made by democratic growth is useful, but probably insufficient. Our central idea is to estimate the appropriate weightings π_i to obtain an aggregate index that best approximates the impact that changes in income can have on collective well-being. In this sense, our approach goes further than that of Aitken & Weale (2020) by better taking into account the impact of income on well-being – with the counterpart of losing a little simplicity. However, it does not go as far in taking into account non-monetary factors as that of Boarini *et al.* (2022), thereby avoiding the lack of consensus on the valuation of dimensions such as health, which was, for example, an obstacle to transforming the Multi-Dimensional Standard of Living into an official OECD indicator, even though this was the original objective.

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1. Let us assume a utility in the form of $V(y_i, q_i) = e_i\left(u + \propto \log(y_i/\omega) + \gamma q_i\right)$ *in which* e_i *is the life expectancy of the individual* i. *The regression of life satisfaction on* $\log(y_i)$ *and* q_i *makes it possible to estimate* $\propto$, ω *and* γ *but not* u. *The parameter* u *is calibrated based on the value of a statistical life (VSL) of an average individual and seeking the solution to the equation* $V(\overline{y}, \overline{q})$=VSL. *This assumption is unnecessary when thinking of current welfare.*

2. The "Value of a Statistical Life" (VSL) used by Jones & Klenow is 6 million dollars (2006 value). Boarini et al. *(2022) use a VSL of 6.6 million dollars (2007 value).*

3. $\frac{\Delta Y}{Y} = \sum \frac{\Delta Y_i}{Y} = \sum \frac{\Delta Y_i}{Y_i}\frac{Y_i}{Y} = \sum \pi_i \frac{\Delta Y_i}{Y_i}$ *where* $\pi_i = \frac{Y_i}{Y}$

4. Let us assume, for example, individual preferences of the type $V_i = V_{max}(Y_i - Y_{min})/Y_i$ *in which* Y_{min} *is a minimum income below which there is no welfare and* V_{max} *is a constant. Then, democratic growth* $1/n\sum \Delta Y_i / Y_i$ *is equal to* $\sum w_i \Delta V_i / V_{max}$ *where* $w_i = 1/n \times Y_i / Y_{min}$. *In effect,* $\Delta V_i / V_m = Y_{min} \times \frac{\Delta Y_i}{Y_i^2}$ *and therefore* $\frac{1}{n}\frac{\Delta Y_i}{Y_i} = \frac{1}{n} \times \frac{Y_i}{Y_{min}} \Delta V_i / V_{max}$.

2. Conceptual Framework

2.1. Real Feel Growth

Let us continue the discussion from the previous section on how to weigh individual growth rates in the formation of an aggregate index.[5] We are therefore looking for weightings π_i such as weighted growth $\sum \pi_i \Delta Y_i / Y_i$ which is a national measurement of economic performance based on changes in income, but one that is more oriented towards well-being than GDP.

First we note that if there is function $U(y)$ such that $\Delta U(y) = U'(y)\Delta y$ is a relevant measurement of the impact of income on individual well-being, then the weighted average of growth rates is a relevant measurement of growth if $\pi_i \Delta Y_i / Y_i$ is proportional to $U'(Y_i)\Delta Y_i$ and $\sum \pi_i = 1$. The combination of the two conditions leads to $\pi_i = U'(Y_i)Y_i / \sum U'(Y_i)Y_i$ and to a relevant weighted growth indicator equal to:

$$WGI = \sum \left[\frac{U'(Y_i)Y_i}{\sum U'(Y_i)Y_i} \right] \Delta Y_i / Y_i \qquad (1)$$

Moving from normative weighted growth to "Real Feel" growth, in terms of well-being or the perception of well-being, requires an accepted concept of income-dependent well-being. We consider a function of well-being $V(y,q)$ in which y is actual income and q is a set of non-monetary dimensions that are important to well-being. Then, a well-being-oriented income growth index is obtained as previously with $U'(Y_i) = \partial V / \partial y(Y_i, Q_i)$.[6]

At this point, there are two possibilities. The first consists in calibrating $V(y,q)$ using "consensual" parameters in the empirical and normative literature, as in Becker *et al*. (2005) or Jones & Klenow (2016). The second possibility, the one we use, is to rely on surveys, which are now well developed, in which respondents provide a score for their life satisfaction. They make it possible to establish a statistical link between that score (written as LS_i), income (Y_i) and the different variables of interest (Q_i): $LS_i = \hat{S}(Y_i, Q_i) + \varepsilon_i$ Without $\hat{S}$ being identical to the function of well-being V mentioned above, it can be reasonably assumed that there is a link between these two functions, of the type: $\hat{S}(y,q) = f(V(y,q))$ in which f is increasing. Consequently, since in the first order $\hat{S}(y,q) \approx f(\bar{S}) + f'(\bar{S}) * \hat{S}(y,q)$, it is possible to write $U'(Y_i) \approx 1 / f'(\bar{S}) * \hat{S}'_y$. Replacing in (1) gives an indicator of Real Feel Growth (written as *RFG*):

$$RFG = \sum \left[\frac{\hat{S}'_y Y_i}{\sum \hat{S}'_y Y_i} \right] \Delta Y_i / Y_i \qquad (2)$$

The linear case $S(y) = \mu(y - z)$, in which y is income and z is a minimum income threshold, gives $\pi_i = Y_i / Y$ and weighted growth as in the usual growth rate. The logarithmic case $S(y) = \mu[\log(y) - \log(z)]$ gives $\pi_i = 1/n$, i.e. the democratic growth used by Aiken & Wales. The class of functions[7] $S(y) = \mu(y^{1-\tau} - z^{1-\tau}) / (1-\tau)$, in which τ is the parameter of aversion to income inequality, which rises as the aversion increases, gives $\pi_i = Y_i^{1-\tau} / \sum Y_i^{1-\tau}$ encompassing the two preceding cases for τ=0 or 1.

2.2. Real Feel GDP

Going beyond the "Real Feel Growth", we would like to be able to define a "Real Feel GDP" indicator. The idea that immediately springs to mind, having mentioned surveys of subjective well-being, is to use either the average life satisfaction itself or, to eliminate purely subjective factors ε_i, projected satisfaction $1/n \sum \hat{S}(Y_i, Q_i)$ based on the statistical assessments we have just discussed. This would raise several difficulties. First, readability: saying that the average monetary satisfaction in France is 7.2 does not mean much to many people. The second is comparability: while surveys in European countries are based on the same methodology, it differs from that used for surveys in other countries. Without going so far as to evoke cultural factors such as a national disposition towards optimism or pessimism, the self-assessment scales of subjective well-being are simply not the same (three options for the General Social Survey in the United States; score of 0 to 10 for EU-SILC, etc.).

The problem is an old one, as is the way to handle it by calculating an equally distributed equivalent income (EDE), as imagined by Atkinson (1970) and Kolm (1969). EDE is the income y^*, identical for all individuals, which would result in the same social well-being $W(y^*..y^*)$ as actual social well-being $W(Y_1..Y_n)$. Considering an additional form of social well-being: $W(Y_1..Y_n) = 1/n \sum V(Y_i)$, in which $V(Y_i)$ is an indirect function of well-being at the individual level. The equally distributed equivalent income is then equal to $V^{-1}(1/n \sum V(Y_i))$ and corresponds to the solution to the equation $W(Y_1..Y_n) = W(y^*..y^*)$.

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*5. This presentation is inspired by discussions with M. Fleurbaey, D. Blanchet and F. Murtin at a seminar of the "*Beyond-GDP*" research chair of the Paris School of Economics.*

6. Or, to use income to reflect the indirect effects of income through *its non-monetary dimensions:* $U'(Y_i) = \frac{\partial V}{\partial y}(Y_i, Q_i) + \sum_k \frac{\partial V}{\partial q_k}(Y_i, Q_i) \frac{\partial q_k}{\partial y}$

7. Class of functions CRRA for Constant Relative Risk Aversion.

Using the example of a function $V(y) = V_{max} \times \frac{y - y_{min}}{y}$, where $V_{max} = 10$ and y_{min} =10,000. Assuming that half of the population has the income Y_1 and the other half has the income Y_2. Well-being is 5 (on a scale of 0 to 10) for an income Y_1 of €20,000[8] and 9 for an income Y_2 of €100,000.[9] The equally distributed equivalent income y^* is the income that corresponds to the average well-being (7), i.e. €33,333.[10] It is below the average income, which stands at €60,000.[11]

In the same spirit, we define Real Feel GDP (*RFGDP*) as a monetary value of national monetary satisfaction, obtained by calculating the income that would give an individual a life satisfaction score equal to the average national satisfaction.

Formally, with the scores mentioned above:[12]

$$RFGDP \equiv \hat{S}^{-1}(1/n \sum_i \hat{S}(Y_i)) \quad (3)$$

In the specific case in which $\hat{S}$ is a function of type $\hat{S}(y) = \alpha \frac{y^{1-\tau} - z^{1-\tau}}{1-\tau}$, as we will assume it to be subsequently, the Real Feel GDP is equal to $Y(\hat{\tau})$ in which $\hat{\tau}$ is the estimated value of τ and $Y(\tau) = (1/n \sum_i Y_i^{1-\tau})^{1/(1-\tau)}$. For this particular class of functions, Real Feel GDP growth is equal to the Real Feel growth as defined above.[13] This gives a greater degree of generality to our summary indicator, since the Real Feel growth does not explicitly refer to the notion of equally distributed equivalent income.

Noting, finally, that $Y(0)$ is equal to income per capita and growth of $Y(0)$ is equal to growth calculated in the usual manner, while $Y(1)$ is equal to the geometric average of income $(\prod_i Y_i)^{1/n}$ and $\Delta Y(1)/Y(1)$ is equal to the democratic growth of Aitken & Weale (2020). This framework includes both indicators in a broader family of income growth indicators. And since $\hat{\tau}$ is estimated, the data "will say" which is the best indicator in terms of impact on well-being, or at least on life satisfaction.

While we do not formally refer to the notion of social well-being in our reasoning, there is nevertheless an implicit function underlying our indicator of Real Feel GDP. In effect, starting from the average life satisfaction at the individual level amounts to assigning, in terms of satisfaction, an equal weighting of 1/*n* to each individual, regardless of their situation: $W(Y_1..Y_n) = \sum \frac{1}{n} \times \hat{S}(Y_i)$. One could naturally question this assumption and suggest higher weightings for lower incomes. However, we can reasonably assume that there would be few voices to support the opposite, i.e. using higher weightings for higher incomes. Thus, our Real Feel GDP can be considered the minimum adjustment to be made relative to the usual weighting of income to better orient GDP towards an indicator of the contribution of income to social well-being. And, as $\hat{\tau}$ has proven to be higher than 1 in our estimates (see section 3), Real Feel GDP could not only perform better than GDP, but also better than democratic growth.

2.3. Real Feel GDP and Distributional National Accounting

We conclude this section with some thoughts on the distribution of national income between households and the individuals who form them. In reality, the Y_i are not completely observable. By simplifying, national income can be broken down into three elements: *M*, household disposable income (income from labour and wealth and transfers received net of taxes of any kind), Π retained earnings of companies (also known as reinvested earnings) and *Q* government income (net of cash transfers to households): $Y = M + \Pi + Q$.

Household disposable income, as defined in national accounting, can be distributed fairly directly at the household level, with the corresponding values (the m_i) being directly observable or calculable based on tax and social data. This is not the case for the other components, although they ultimately "belong" to households. The objective of distributional national accounting discussed in section 1 is to define acceptable methods of allocating these incomes to each household.

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8. $10 \times \frac{20{,}000 - 10{,}000}{10000}$

9. $10 \times \frac{100{,}000 - 10{,}000}{100{,}000}$.

10. $S(33{,}333) = 10 \times \frac{33{,}333 - 10{,}000}{33{,}333}$

11. *Moreover, the application of equation (2) gives an expression of Real Feel growth equal to* $\frac{5}{6}\frac{\Delta Y_1}{Y_1} + \frac{1}{6}\frac{\Delta Y_2}{Y_2}$ *compared to* $\frac{1}{6}\frac{\Delta Y_1}{Y_1} + \frac{5}{6}\frac{\Delta Y_2}{Y_2}$ *for usual growth and* $\frac{\Delta Y_1}{Y_1} + \frac{\Delta Y_2}{Y_2}$ *for democratic growth*

12. *The individual income corresponding to this score is equal to* $y^* = \hat{S}^{-1}(\bar{s})$. *In effect, the average national monetary satisfaction is equal to* $(\bar{s}) = 1/n \sum_i \hat{S}(Y_i)$

13. *By deriving (3), this gives* $\Delta RFGDP = 1/\hat{S}'(RFGDP) \times \frac{1}{n} \sum_i \hat{S}'(Y_i) \Delta Y_i$ *or even* $\Delta RFGDP / RFGDP = 1/n \sum_i \left[\frac{\hat{S}'(Y_i) Y_i}{\hat{S}'(RFGDP) RFGDP} \right] \Delta Y_i / Y_i$. *As in the case of a* CRRA, $\hat{S}'(y_i) y = \hat{\alpha} y^{1-\hat{\tau}}$ and that $RFGDP^{1-\hat{\tau}} = 1/n \sum_i Y_i^{1-\hat{\tau}}$, $\Delta RFGDP / RFGDP = 1/n \sum_i \left[\frac{Y_i^{1-\hat{\tau}}}{1/n \sum_i Y_i^{1-\hat{\tau}}} \right] \Delta Y_i / Y_i = RFG$

For example, the aforementioned group of experts on the measurement of inequality and redistribution (INSEE, 2021) suggest to allocate to each of them a share r_i of the retained earnings Π, proportional to the dividends received and, for each public service k, a share q_i^k of the corresponding public expenditure. For example, expenditure on education is distributed in proportion with the number of children and their age, cross-referenced with data on educational costs per pupil according to the level and type of education. In another example, the share of health care expenditure is based on health insurance expenditure for reimbursement of care. The breakdown of national income takes the form, for each individual, of an income $Y_i = m_i + r_i + \sum_k q_i^k$ such as $\sum_i m_i = M$, $\sum_i r_i = \Pi$, $\sum_i \sum_k q_i^k = Q$, and, subsequently $\sum_i Y_i = Y$. More generally, the q_i^k can be rewritten as the product of a weighting matrix based on the individual characteristics X_i of the individual i, using a vector of collective consumption $Q = \left(Q^1, .., Q^K\right)$ in which Q^k is the national expenditure of public service k. Real Feel GDP (3) is then expressed as:

$$RFGDP \equiv (1/n \sum_i \left(m_i + r_i + X_i Q\right)^{1-\hat{\tau}})^{1/\left(1-\hat{\tau}\right)} \quad (4)$$

3. Estimation of the Link Between Subjective Well-Being and Income

The calculation of Real Feel GDP requires first establishing a link between subjective well-being, as measured by life satisfaction surveys, and income. Here we assume there is a functional form of individual preferences of the CRRA (Constant Relative Risk Aversion) type and a proportional link between preferences and life satisfaction as measured in household surveys. Formally, this means that life satisfaction and income are linked by the following relationship:

$$LS_i = \omega + \mu \frac{\left(y_i / \bar{y}\right)^{1-\tau}}{1-\tau} + \theta_i \quad (5)$$

in which LS_i is the life satisfaction of the individual i, y_i is the disposable income per consumption unit of the individual i, $\bar{y}$ is the average value of y_i across the sample and θ_i is the residual. The parameters ω, μ and τ are obtained through non-linear regressions of the relationship (5) under the assumption of distributed residuals in accordance with a Gaussian law.[14]

3.1. Estimation Based on Personal Data

We first perform estimates on cross-sectional personal data from the hedonic regression (5) using the 2010-2019 SRCV (*Statistiques sur les Ressources et les Conditions de Vie* [Statistics on Income and Living Conditions]) surveys. The SRCV survey contains a variety of data concerning the income and living conditions of households and the individuals who form them. The SRCV survey is the French part of the large EU-SILC (standing for European Union Statistics on Income and Living Conditions) database, consisting of a set of surveys established homogeneously across European countries. The French survey is conducted annually and the sample contains around 11,500 households and 26,500 individuals each year.

Since 2010, respondents have also been asked about subjective well-being. More specifically, they are asked to respond to the following questions: *"on a scale of 0 (not at all satisfied) to 10 (very satisfied), can you tell us your own satisfaction with i) your home; ii) your work; iii) your leisure; iv) your relationships with family, friends and neighbours; v) the life you are living right now?"*. Here we will focus on the general assessment of life satisfaction. Over 2010-2019, we have a total of 148,000 observations for which life satisfaction and income are reported at the same time. Current disposable income is deflated by the consumer price index.

For the sample as a whole (Table 1), we obtain a value $\hat{\tau}$ equal to 2.06 in a 95% confidence interval of [1.98-2.14]. The value is remarkably stable on different sub-samples, at around the value 2, with a minimum of 1.75 (South-west region or large cities) and a maximum of 2.41 (Mediterranean region).

There is also no significant change in the parameter $\hat{\tau}$ between 2010 and 2019. When we split the sample into two sub-periods, 2010-2014 and 2015-2019, we find a $\hat{\tau}$ in the interval [2.07-2.31] for the first period and [1.81-2.05] for the second. Simulated satisfaction at the average income level, $\hat{S}(\bar{y}) = \omega + \frac{\mu}{1-\tau}$, is slightly lower for the second period (7.50) than for the first period (7.42). However, it is important to not read too much into this decrease: in addition to the size of the annual sub-samples and the slight fall over time, which make it difficult to observe trends, a change in the method used for the survey led to an abnormally marked drop in life satisfaction in 2012 (7.07 in 2013 compared to 7.51 in 2012).

14. *The estimated preferences,* $\hat{S}(y) = \hat{\omega} + \hat{\mu} \frac{\left(y_i / \bar{y}\right)^{1-\hat{\tau}}}{1-\hat{\tau}}$ *are identical to those mentioned in §2,* $V(y) = \alpha \frac{y^{1-\tau} - z^{1-\tau}}{1-\tau}$ *with* $\alpha = \mu \bar{y}^{\tau-1}$ and $z = \left(\bar{y}^{\tau-1} + (\tau-1)\omega/\mu\right)^{1/(1-\tau)}$.

Table 1 – **Estimate of the life satisfaction/income relationship**

	τ	μ	$\hat{S}(\bar{y})$	Average income	Average satisfaction	Observations
Total	2.06 (0.04)	0.70 (0.01)	7.44	27,247	7.26	148,619
Women	1.97 (0.05)	0.72 (0.02)	7.43	26,792	7.22	86,483
Men	2.18 (0.07)	0.66 (0.02)	7.48	27,742	7.31	62,136
2010-2014	2.19 (0.06)	0.69 (0.02)	7.50	27,038	7.28	74,323
2015-2019	1.93 (0.06)	0.70 (0.02)	7.42	27,417	7.24	74,293
Aged 16-29	1.88 (0.19)	0.48 (0.04)	7.88	23,956	7.68	15,619
Aged 30-42	2.28 (0.10)	0.70 (0.03)	7.63	25,438	7.40	28,290
Aged 43-54	2.37 (0.07)	0.83 (0.03)	7.42	25,781	7.16	31,983
Aged 55-66	1.89 (0.06)	0.91 (0.02)	7.40	31,258	7.25	35,022
Aged 67 and over	1.80 (0.09)	0.68 (0.02)	7.14	28,127	6.99	37,705
Low urban density	2.19 (0.09)	0.61 (0.02)	7.51	25,415	7.30	52,158
Average urban density	2.03 (0.09)	0.71 (0.03)	7.48	26,473	7.27	36,075
High urban density	1.97 (0.06)	0.75 (0.02)	7.40	28,921	7.22	60,366
Fewer than 5,000 inhabitants	2.27 (0.10)	0.60 (0.03)	7.49	25,762	7.29	16,698
5 to 50,000 inhabitants	2.00 (0.11)	0.75 (0.03)	7.42	25,692	7.21	20,949
50 to 200,000 inhabitants	1.79 (0.10)	0.88 (0.03)	7.41	27,150	7.16	15,393
200,000 to 2 million inhabitants	1.75 (0.09)	0.73 (0.02)	7.44	27,053	7.27	28,980
Greater Paris area	2.02 (0.12)	0.72 (0.03)	7.32	32,262	7.24	12,095
Île-de-France	2.18 (0.10)	0.74 (0.03)	7.34	32,500	7.23	17,404
Paris basin	1.90 (0.10)	0.73 (0.03)	7.42	25,658	7.21	25,716
North and East	2.00 (0.12)	0.70 (0.03)	7.48	25,028	7.24	22,863
West	2.11 (0.10)	0.74 (0.03)	7.50	27,307	7.30	22,308
South-West	1.75 (0.13)	0.72 (0.04)	7.43	26,548	7.23	16,130
Centre-East	1.91 (0.13)	0.69 (0.03)	7.42	27,482	7.28	15,594
Mediterranean	2.41 (0.13)	0.73 (0.05)	7.48	26,861	7.21	14,185
Single	1.94 (0.10)	0.68 (0.03)	7.02	25,169	6.77	31,889
Single-parent family	1.86 (0.23)	0.66 (0.07)	6.93	20,713	6.60	10,793
Couple without children	2.01 (0.08)	0.63 (0.02)	7.57	31,681	7.50	52,878
Couple with child(ren)	2.28 (0.10)	0.49 (0.02)	7.74	26,397	7.60	49,627

Sources: 2010-2019 SRCV surveys, INSEE. Author's calculations.

The simulated preferences[15] with values estimated over the entire representative sample show good reproduction of life satisfaction as a function of standard of living (Figure I). Above €30,000 per CU, satisfaction increases only slightly with income, which can be interpreted as a form of satiety. For the top 5% of incomes, the curve is slightly above the observation, meaning that the satiety effect may be even greater than in our estimates. A more comprehensive measurement of very high incomes would likely lead to an even faster fall in the marginal utility of income and a higher value for τ.

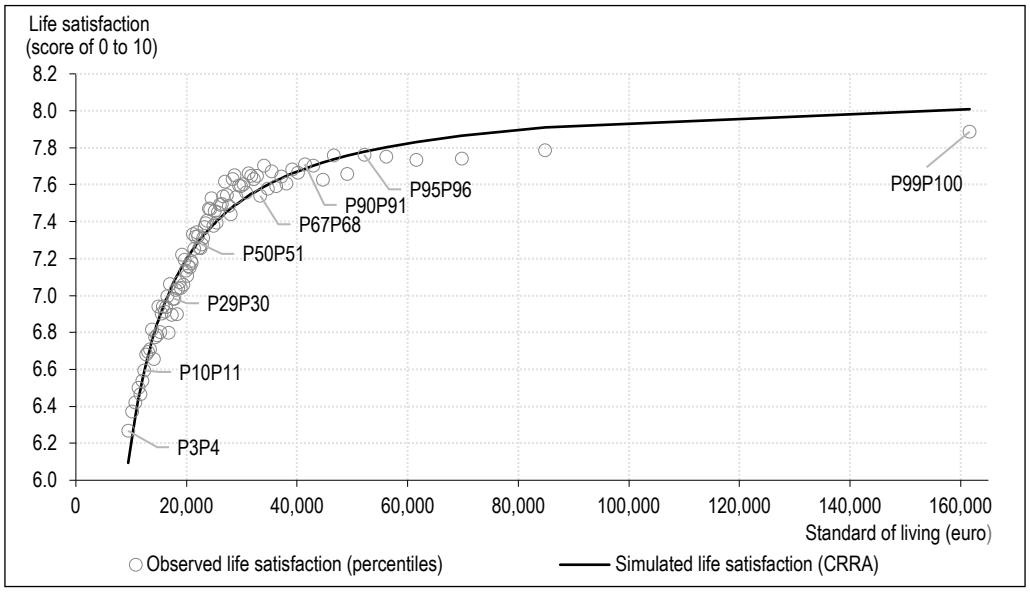
These estimates rule-out the often used assumption of a log-linear link between life satisfaction and income, which would correspond to a value of 1 for τ. They are also higher than those in the reference study by Layard *et al.* (2008). The authors find a value of 1.26 in an interval [0.96-1.55] for the USA using data from the GSS (General Social Survey), of 1.15 for Germany (0.99-1.65) using GSOEP (German Socio-Economic Panel) data, of 1.32 for the UK using the BHPS (British Household Panel Survey) and of 1.25 (1.02-1.49) for Europe using the ESS (European Social Survey).

One possible reason for the difference may stem not from any feature specific to France (we will see that this is not the case in section 3.3), but from the fact that Layard *et al.* (2008) exclude the top 5% of incomes from the distribution.[16] However, if high incomes are measured imperfectly, it is more in the sense of them being under-estimated; excluding them leads to under-estimating the preferences curve and consequently the value of τ. Further studies have resulted in higher τ values for the United States:

15. $\hat{S}(y) = \hat{\omega} + \hat{\mu}\frac{(y_i/\bar{y})^{1-\hat{\tau}}}{1-\hat{\tau}}$

16. *For similar reasons, Layard* et al. *(2008) also exclude the lowest 5% of incomes, which are considered to be under-estimated due to the lack of consideration of the variety of sources of income, intra-family transfers, the dissaving of older people and undeclared work. The quality of the information included in the SRCV survey and the size of our sample allow us to retain 97% of the sample.*

Figure I – **Observed and simulated life satisfaction (France, 2010-2019)**



Sources: 2010-2019 SRCV surveys, INSEE. Author's calculations.

for example, Gandelman (2013) finds a value of 1.89 using the BHPS and 1.71 using the GSS.

3.2. Robustness: Introduction of Other Explanatory Variables

Finally, we test the robustness of our estimate of τ by adding characteristics other than income:

$$LS_i = \omega + \mu \frac{\left(y_i / \bar{y}\right)^{1-\tau}}{1-\tau} + \Gamma X_i + \theta_i \qquad (6)$$

where Γ is a vector of parameters and X_i is a set of personal characteristics, namely age, whether or not the respondent lives in a couple and whether or not they are unemployed. The results are presented in Table 2. The value of τ remains close to 2, at 1.87 in a 95% confidence interval of [1.79-1.95]. The three dimensions have a very significant impact on life satisfaction. The age-related decrease in life satisfaction at constant income (−12 percentage points per decade older) is sometimes interpreted as a phenomenon whereby people become accustomed to or weary of what they have (Easterlin, 1995), which leads to the need for an increase in consumption, and therefore income, to maintain a given level of satisfaction. From a certain age, it is also due to the deterioration of health. Whether or not the respondent lives in a couple also counts, with a difference of −40 points for single people compared to those living in a couple. With the average age of the population rising (+1.5 years in 2019 compared to 2010), as well as the proportion of people living alone (increased from 19 to 22%), these correlations produce a downward trend, all other things being equal, in average life satisfaction at the national level, but one that is limited in scope (−0.3 points per year). Finally, unemployment has a very strong negative effect (−80 percentage points) on life satisfaction.

To reflect the indirect effects of income on life satisfaction,[17] in particular through the risk of

17. *Assuming a utility equal to* $V(Y,Q)$ *in which* Y *is the income and* Q *is the non-monetary dimension of welfare, assumed to depend in part on* Y. *The equally distributed equivalent income can be calculated either as the solution to* $\sum V(Y_i,Q_i) = \sum V(Y_\star,Q_\star)$ *or, to reflect the indirect effects, as the solution to* $\sum V(Y_i,Q_i) = \sum V(Y_\star,Q(Y_\star))$. *Relationship (5) rather than (6) amounts to giving preference to the second option.*

Table 2 – **Estimate of individual preferences**

	Estimate	Confidence interval at 95%	Value in 2010 and 2019	Variation/contribution
Life satisfaction	-	-	7.32 to 7.31	−0.011
μ	0.67 (0.01)	0.65; 0.69	27,239 to	+0.005
τ	1.87 (0.04)	1.79; 1.95	27,441	
Being unemployed	−0.80 (0.02)	−0.78; −0.66	0.062 to 0.056	+0.004
Not being in a couple	−0.40 (0.02)	−0.43; −0.37	0.190 to 0.220	−0.014
Age	−0.012 (0.0002)	−0.0115; −0.0125	48.28 to 49.75	−0.019

Sources: 2010-2019 SRCV surveys, INSEE. Author's calculations.

unemployment which is more often associated with low income, we then give preference to the parameters estimated without the introduction of these other characteristics. The other option is set out in Online Appendix S1 (link to the Online Appendix at the end of the article).

3.3. Robustness: Estimates Using 26 European Countries

In this section, we verify the consistency of the τ value estimated on the basis of micro-data on panel data at European level. We use open access data from the EU-SILC household survey. They show the average level of life satisfaction per quintile of disposable income (per consumption unit) for 26 European countries (Figure II).

We assume that the marginal utility of income does not vary from one country to another, nor do the parameters $\bar{y}$ and μ:

$$LS_{ij} = \omega_j + \mu \frac{\left(y_{ij} / \bar{y}\right)^{1-\tau}}{1-\tau} + \theta_{ij} \qquad (6)$$

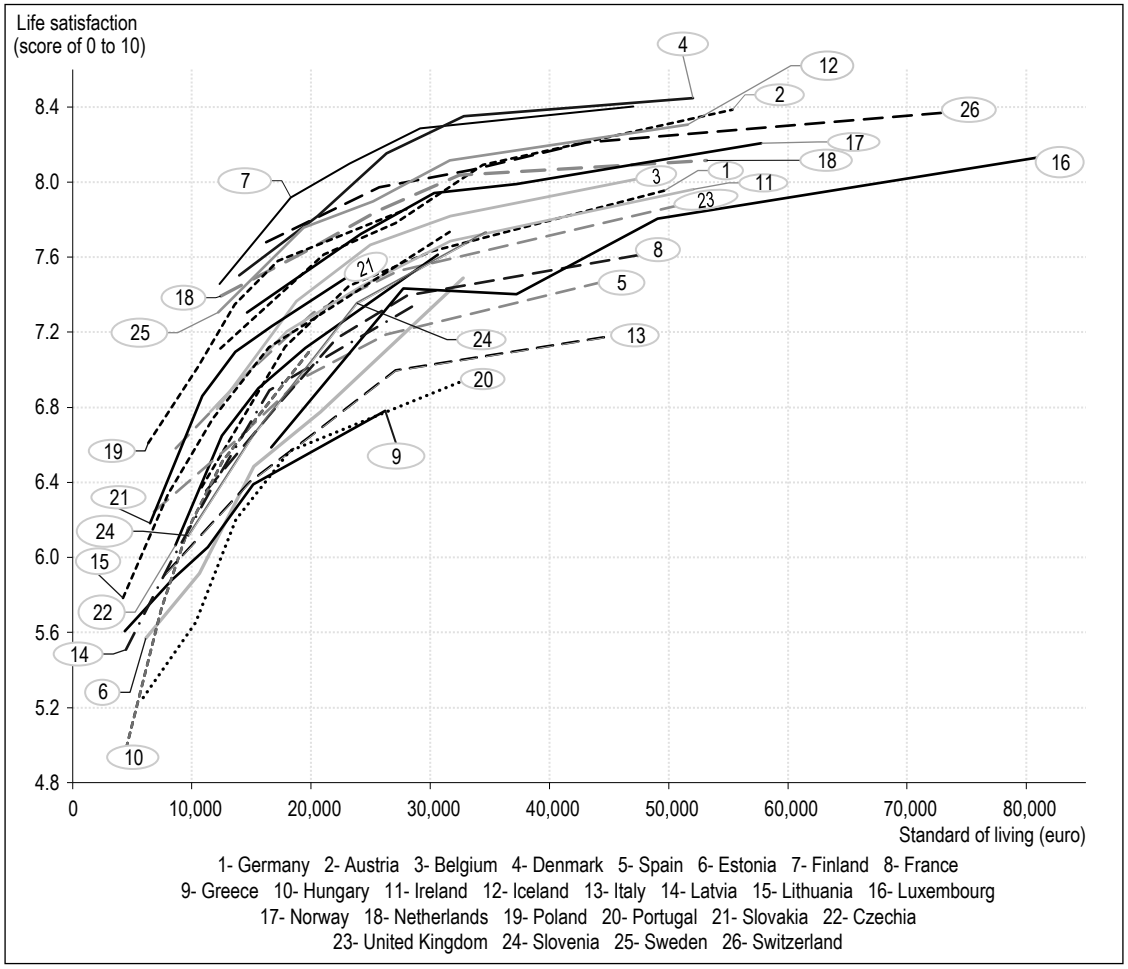
in which LS_{ij} is the life satisfaction of the individual i in the country j, y_{ij} is the disposable income per consumption unit of the individual (i,j), ω_j is a constant specific to each country and θ_{ij} is the assumed residuals of the Gaussian distribution.

For the purposes of comparability with the results of the previous section, $\bar{y}$ is set at the same level as before (€27,247 per year). Finally, given the difficulties of measuring very low standards of living, incomes below €9,059 per year (which corresponds to the 3rd French centile) are excluded.

The inequality aversion parameter τ is 1.9 in a 95% confidence interval of [1.75-2.05] (Table 3). Our estimate therefore also rejects the logarithmic assumption (τ=1) and shows compatibility with the estimate of 2.06 (1.98-2.14) obtained using French data (cf. Table 1).

Finland has the highest value for the country-specific parameter ω_j, with, all other things being equal, a life satisfaction 0.9 points above that of France, which is set as a reference (Figure III). The lowest country indicator variables are Portugal (−0.46), Greece (−0.39) and Italy (−0.37).

Figure II – **Life satisfaction by income quintile for 26 European countries**



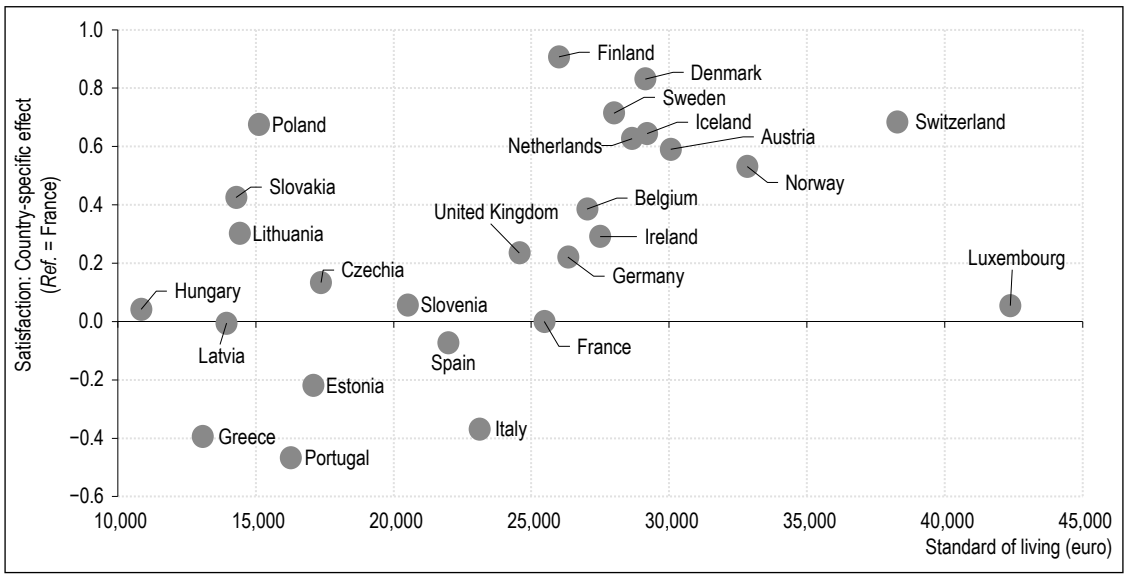
Sources: Euro-SILC.

Table 3 – **Cross-country estimate of preferences**

Variables	Estimate	Standard error	Student test
τ	1.904439***	0.0761	25.04
μ	0.705898***	0.0215	32.91
ω	8.089057***	0.0840	96.31
Fixed country effect (ω_j)			
Austria	0.386183***	0.0491	7.86
Belgium	0.589677***	0.0550	10.73
France	0.000000	-	-
Germany	0.2199***	0.0252	8.73
Luxembourg	0.048091	0.1993	0.24
Switzerland	0.68106***	0.0563	12.11
Denmark	0.832411***	0.0665	12.51
Finland	0.90929***	0.0679	13.39
Netherlands	0.626909***	0.0415	15.10
Norway	0.530456**	0.0694	7.65
Sweden	0.714402***	0.0518	13.79
United Kingdom	0.236448**	0.0283	8.36
Ireland	0.290398*	0.0723	4.02
Iceland	0.645789*	0.2620	2.47
Greece	−0.39439**	0.0633	−6.23
Spain	−0.07088*	0.0314	−2.26
Portugal	−0.46863**	0.0568	−8.26
Italy	−0.36655***	0.0290	−12.62
Czechia	0.137838*	0.0560	2.46
Estonia	−0.22004	0.1504	−1.46
Hungary	0.03536	0.0668	0.53
Lithuania	0.302191*	0.1191	2.54
Latvia	−0.00344	0.1431	−0.02
Poland	0.675669***	0.0340	19.89
Slovenia	0.055466	0.1082	0.51
Slovakia	0.42655**	0.0760	5.61
Mean squared errors	23,442	R^2	0.9842
Year	2016-2017	Number of obs.	114 (DF: 86)

Sources: Euro-SILC. Author's calculations.

Figure III – **Country-specific factor in life satisfaction**



Sources: Euro-Survey on Income and Life Conditions, author's calculations.

The preference curve estimated based on macro-data is, as at the individual level, a good proxy for life satisfaction corrected for the country-specific effect ω_j (Figure IV).

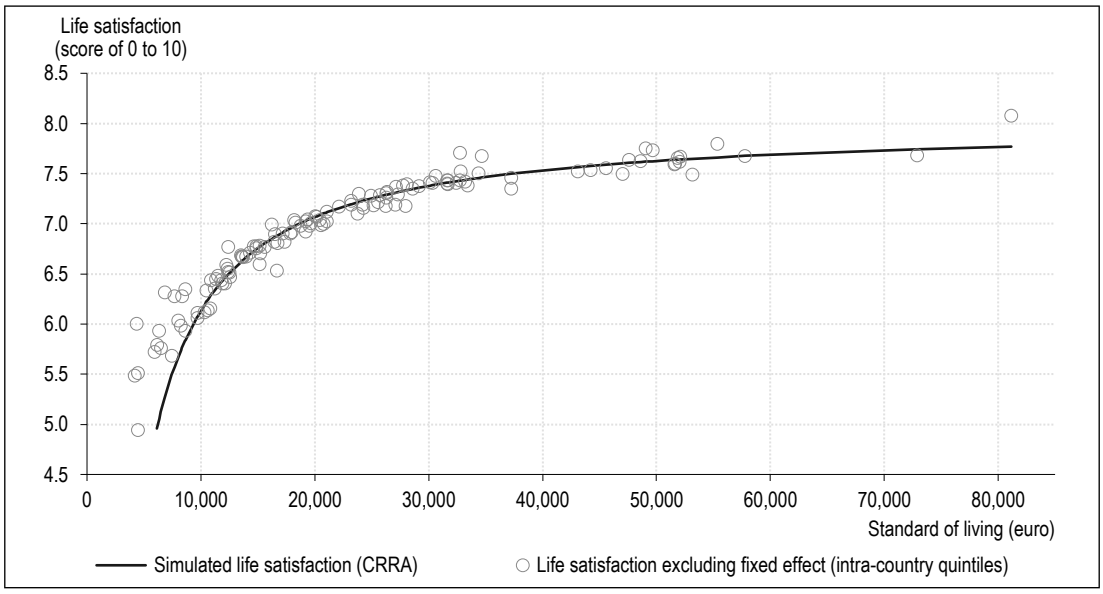
This result is obtained by excluding very low incomes, which appear significantly above the curve. In order to test the robustness of our estimate, we perform a regression on sub-groups of countries (Table 4). Our sample is first divided into two groups, the first including countries with a first high quintile and the second including countries with a first low quintile.

The parameter τ is very close to our central estimates in the first case (τ =1.95) and much lower for the low Q1 group (τ =1.28 with a 95% confidence interval of 1.19-1.37). We then divide our sample into five geographical subsets: Northern Europe (Denmark, Finland, Netherlands, Sweden and Norway), Western Europe (Austria, Belgium, Switzerland, Germany, Denmark, Finland, France, Ireland, Iceland, Luxembourg, Netherlands, Norway, Sweden and Slovenia), North-West Europe (United Kingdom, Ireland and Iceland), Eastern Europe (Estonia, Hungary, Lithuania, Latvia, Poland, Slovenia and Slovakia) and Southern Europe (Spain, Greece, Italy and Portugal).

The inequality aversion parameter τ is highest for the Western Europe and Northern Europe groups, with 95% confidence intervals of [1.81-2.01] and [1.52-1.96], respectively. It is significantly lower for Southern and Eastern Europe, but also for the United Kingdom, Ireland and Iceland group.

To summarise, the cross-country regression shows a life satisfaction, for all European

Figure IV – **Harmonised* and simulated life satisfaction for 26 European countries**



*The points represent quintiles of standard of living for each of the 26 countries; harmonised life satisfaction is calculated by deducting the fixed country effect from the observed values.
Sources: Euro-Survey on Income and Life Conditions, author's calculations.

Table 4 – **Cross-country estimate of preferences**

Group of countries	Estimated value of τ	Standard error	Confidence interval of 68%
Q1 high[1]	1.945***	0.097	1.85-2.04
Q1 low	1.275***	0.086	1.19-1.36
North-Eastern Europe[2]	1.736***	0.220	1.52-1.96
Western Europe[3]	1.906***	0.105	1.80-2.01
North-Western Europe[4]	1.271***	0.072	1.20-1.34
Eastern Europe[5]	1.286***	0.126	1.16-1.41
Southern Europe[6]	1.089***	0.090	1.00-1.18

Notes: [1] Austria, Belgium, Switzerland, Germany, Denmark, Finland, France, Ireland, Iceland, Luxembourg, Netherlands, Norway, Sweden and Slovenia [2] Denmark, Finland, Netherlands, Sweden and Norway [3] Austria, Belgium, Switzerland, Germany, France and Luxembourg [4] United Kingdom, Ireland and Iceland [5] Estonia, Hungary, Lithuania, Latvia, Poland, Slovenia and Slovakia [6] Spain, Greece, Italy and Portugal.
Sources: Euro-SILC. Author's calculations.

countries, consistent with the preference curve estimated using French micro-data, and in particular with a value of 2 for the inequality aversion parameter τ. This result is also valid for 18 of our 26 countries when taken separately, representing half of the total population of the countries concerned. For the other countries, only an analysis carried out on micro-data could tell us whether the lower value obtained for inequality aversion reflects a reality or is due to the fact that they are on the "log-linear part" of a decreasing preference function for the marginal utility of income. Using a value of 2 for the rest of our estimates means that our results are representative of the Real Feel growth as perceived by at least the vast majority of Europeans.

4. Real Feel Growth in the USA and 14 European Countries

4.1. From Concept to Practice

Once the link between income and life satisfaction has been assessed, we can assess Real Feel GDP. Here, we assume a population divided into K homogeneous income groups.[18] The main reason for proceeding at a semi-aggregated level rather than at the individual level is the lack of reliable micro-data over a wide range of countries and time periods. In a single group k, the income y_i can be considered close to the average income $\bar{y}_k$ and the expression of Real Feel GDP (3) can be reformulated as:[19]

$$RFGDP \approx \frac{NNI}{POP} \times \frac{POP}{ADU}\left(\sum_{k=1 to K} \pi_k \left[\bar{Y}_k / \bar{Y} \right]^{1-\hat{\tau}} \right)^{1/\left(1-\hat{\tau}\right)} \quad (7)$$

in which NNI is the net national income, POP is the total population, ADU is the adult population and π_k is the number of individuals in group k as a proportion of the total population.

We derive population data and net national income (calculated by deducting consumption of fixed capital from net national product) from the World Bank database (Table 5). For the income distributions, we use the distributed national accounts of the World Inequality Lab.[20] They combine tax, survey and national accounts data to estimate the so-called "pre-tax" and "post-tax" distributions of national income in various countries over the past decades (Bozio *et al.*, 2018; Garbinti *et al.*, 2018; Alvaredo *et al.*, 2016, 2020; Blanchet *et al.*, 2019).

National income is distributed among households and then equally among adults in the same household (equal-split adults). The average income of individuals in the decile k, y_k is calculated by adding together disposable income per adult m_k, reinvested earnings r_k and an in-kind valuation of public services corresponding to the share of the corresponding

18. Further on, we will use the disposable income deciles, thus a value of K=10.

19. In effect: $(1/n\sum_i Y_i^{1-\tau})^{1/(1-\tau)} = \bar{Y}\left(1/n\sum_i \left[Y_i/\bar{Y}\right]^{1-\tau}\right)^{1/(1-\tau)} = RNN/ADU \times \left(1/n\sum_i \left[Y_i/\bar{Y}\right]^{1-\tau}\right)^{1/(1-\tau)}$ *and* $1/n\sum_i \left[Y_i/\bar{Y}\right]^{1-\tau} = \sum_{k=1 to K} \pi_k \left[Y_k/\bar{Y}\right]^{1-\tau}$

20. https://wid.world/

Table 5 – **GDP, population and inequality indicators**

	GDP	Population	Population growth (%)	Atkinson index	Atkinson index	D10/D01	D10/D01
Year	2019	2019	1980-2019	2019	1980	2019	1980
USA	19,731	329	1.0	0.582	0.363	39	13
Europe(*)	14,841	415	0.5	0.329	0.316	12	11
Belgium	488	12	0.4	0.305	0.522	10	27
Czechia	232	11	0.1	0.180	0.082	6	3
Denmark	325	6	0.3	0.271	0.218	9	7
Finland	249	6	0.4	0.236	0.221	7	7
France	2,404	67	0.5	0.248	0.330	8	11
Germany	3,434	84	0.8	0.378	0.336	15	12
Greece	185	11	0.3	0.501	0.615	24	44
Italy	1,744	61	0.2	0.434	0.318	18	11
Netherlands	835	17	0.5	0.324	0.245	11	8
Portugal	219	10	0.1	0.427	0.317	19	10
Spain	1,255	46	0.5	0.478	0.445	24	20
Sweden	479	10	0.4	0.211	0.205	7	6
Switzerland	626	9	0.8	0.464	0.474	22	24
United Kingdom	2,366	67	0.4	0.295	0.261	10	8

(*) Europe: The 14 countries listed in the table.
Sources: for GDP, population and population growth: World Bank; for the Atkinson index and the D10/D01 report: WID.

public expenditure:[21] $y_k = m_k + r_k + Q / n_k^A$ in which n_k^A is the number of adults in the group k. The values are in euro, using the exchange rates from the year 2019.

4.2. Real Feel Growth Has Been Stalled in the USA for Over Forty Years

We now return to the analysis of growth over past decades in the light of Real Feel GDP, starting with the USA. During the years 1950-1978, our indicator of Real Feel growth grew faster than national income per capita (multiplied by 2.4 and 1.6, respectively), and almost at the same rate as GDP (multiplied by 2.6). This period of high distribution of the benefits of growth, particularly under the Truman, Kennedy and Johnson administrations, gave way to a radically contrasting development from the 1980s onwards (Figure V).

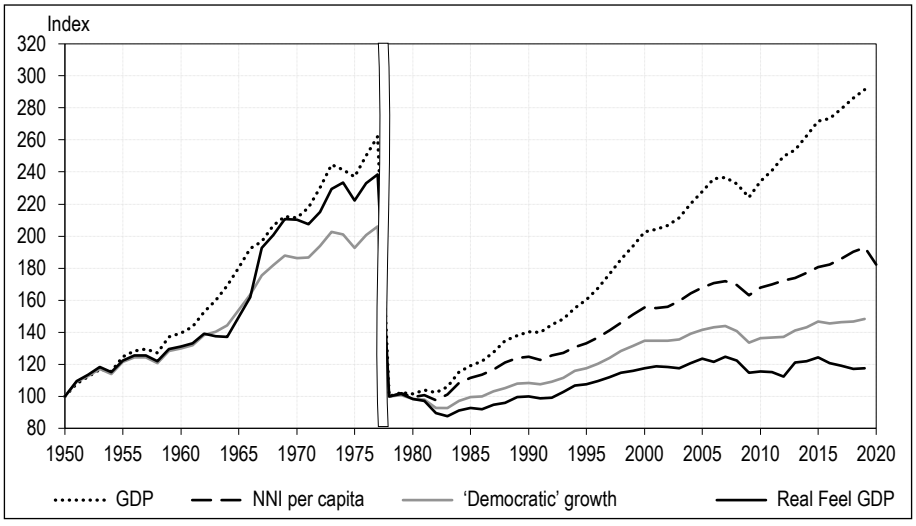
While GDP continues to grow rapidly (multiplied by 3 between 1980 and 2019), as does net national income per capita (multiplied by 1.8), having been little impacted by recessions (1979, 1982 and 1991) except for the one in 2007, Real Feel GDP has come to an abrupt halt which persists to this day. Its cumulative growth was limited to 19% over the period, with sharp declines (−10% after the second oil crisis and −10% again after the great recession of 2008) interspersed with periods of weak growth. Our Real Feel GDP indicator delivers a message consistent with that of Piketty *et al.* (2017),[22] namely one of virtual stagnation for what is now almost half a century.

Also in Figure V we show Aitken & Weale's democratic growth index which, let us remember, consists in calculating growth as the average of individual growth rates or, failing that, of categories of individuals, here grouped by income deciles. It shows an intermediate progression between national income per capita and Real Feel growth. Although it does not sufficiently correct the effects of the unequal distribution of the benefits of growth on well-being, it is undeniably an interesting indicator because of its simplicity and readability.

If we compare these trends with the change in income deciles in levels, we can determine that GDP corresponds to the income of the more affluent households, the Aitken & Weale index corresponds to the median income and Real Feel GDP corresponds to the average income of the most disadvantaged 50% (Figure VI). However, none of the three indices could summarise a specific decile. Real Feel GDP, which was initially close to the 3rd decile, moved closer to the 4th decile in the 1960s before falling, starting in the 1980s and continuing for the following four decades, back to the 3rd decile. National income per capita, which was close to the 7th decile for a long time, has moved closer to the 8th decile with the surge in very high incomes. The income underlying democratic growth, which was close to the 5th decile, deviated upwards in the 1980s, before returning to that position over the last decade.

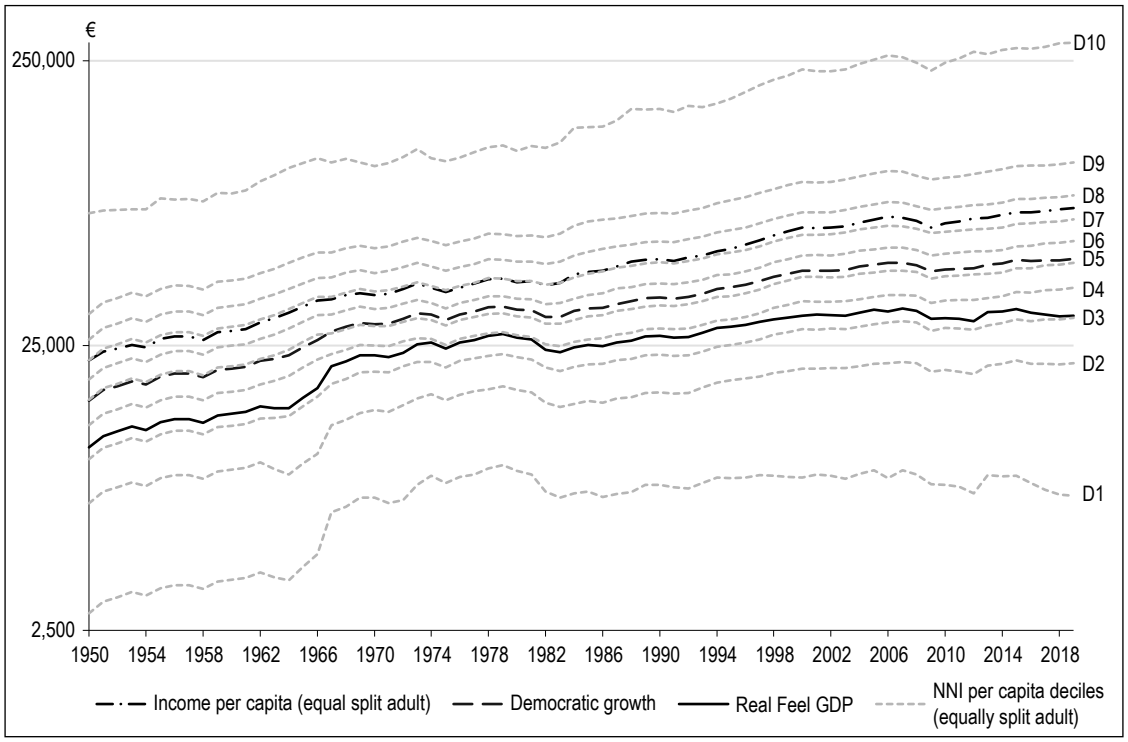
21. In national accounting, this corresponds to collective consumption expenditure minus social benefits.
22. In particular, they show that the average income of the poorest 50 percent of the population has remained stable over the past 40 years.

Figure V – **GDP and Real Feel GDP in the USA (1950-2020)**



Sources: World Bank. World Inequality Lab. Author's calculations.

Figure VI – **Real Feel GDP and income deciles in the USA (1950-2020)**



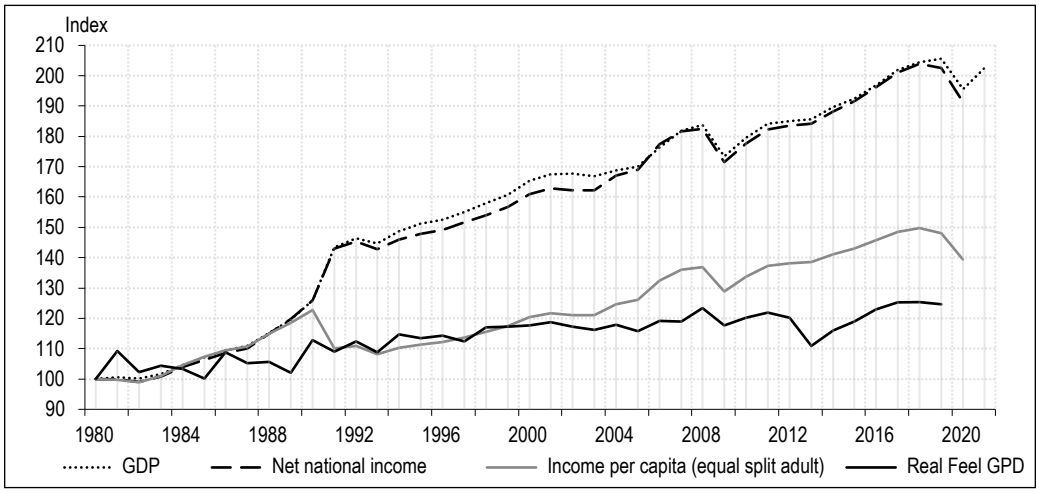
Sources: World Inequality Lab. Author's calculations

4.3. The Stagnation of the 2000s in Germany

Germany (Figure VII) presents a second scenario with, as in the United States but for a shorter period of time, stalled Real Feel growth despite GDP growth. Thus, between 2001 and 2019, GDP grew by 35% and GDP per capita grew by 20%, while Real Feel GDP had virtually stopped growing (5% over 20 years). This can be seen as a consequence of the rise in inequality generally attributed to Hartz laws in the labour market.

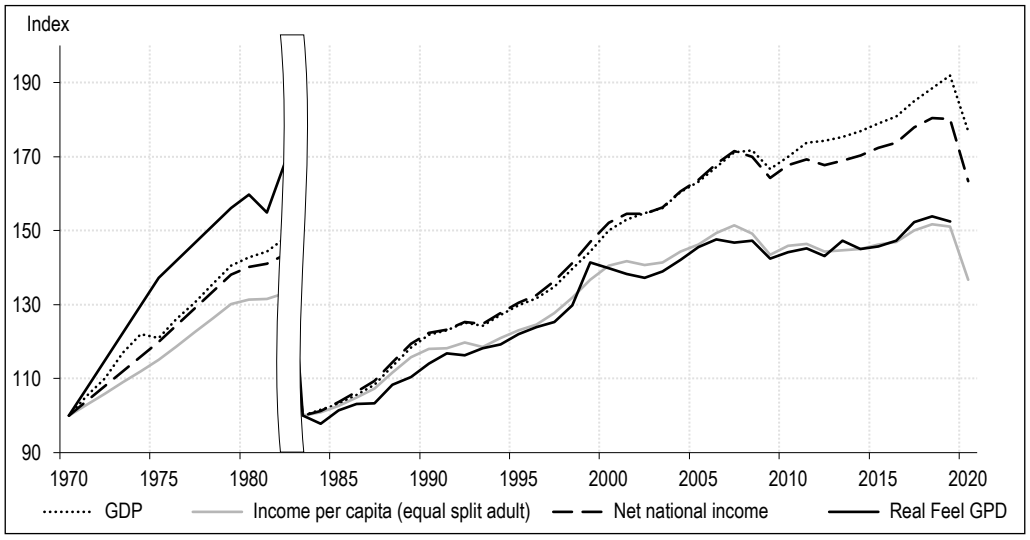
As for France, for which our oldest data date back to 1970, we can also make a distinction between two very different periods (Figure VIII). First, very fast growth of Real Feel GDP from 1970 to 1983 (Real Feel GDP multiplied by 1.7), faster than GDP (multiplied by 1.5). The period was marked in particular by the increase in the minimum wage and the minimum old age pension which, among other things, had reduced inequalities very significantly. After 1983, Real Feel GDP developed in parallel with the national income per capita (multiplied by 1.5), but with short-term disparities. Over the same period, GDP doubled.

Figure VII – **Growth and Real Feel growth in Germany (1980-2021)**



Sources: World Bank. World Inequality Lab. Author's calculations.

Figure VIII – **Growth and Real Feel growth in France (1970-2020)**



Sources: World Bank. World Inequality Lab. Author's calculations.

As an alternative to Real Feel GDP, we presented above a Real Feel disposable income indicator (Box) calculated based on disposable income data by fractile. The two indicators are compared, in the context of France, in Figure IX. For Real Feel disposable income, the data are derived from INSEE's *Enquête sur Revenus fiscaux et sociaux* (Tax and Social Income Survey) using the OECD equivalence scale (cf. section 2.3).

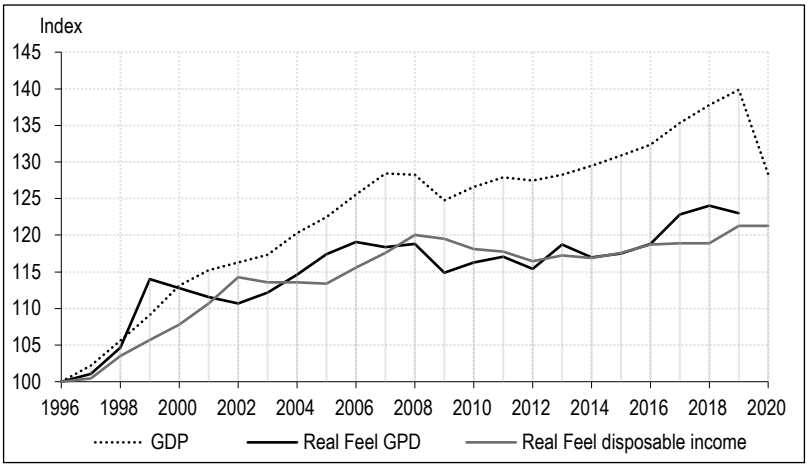
Between 1996 and 2019, the two indicators increased to the same extent (+20%) with, however, more volatility, both upward and downward, for Real Feel GDP than for Real Feel disposable income, reflecting greater volatility for GDP than for disposable income. In 2020, for example, Real Feel GDP resisted despite the plunge in GDP caused by the COVID crisis. Household disposable income, as well as inequalities, have been maintained at the 2019 level due to significant public support for household income, notably through the extension of the partial unemployment scheme.[23]

4.4. In Terms of Monetary Well-Being, France Is Now Ahead of the USA

The analysis in terms of Real Feel GDP also allows us to revisit international comparisons and leads to a complete revision of hierarchies. Over the period 1980-2020, the largest gap between Real Feel GDP and GDP is observed in the USA, where Real Feel growth is 5.5 times

23. Beyond the sources, this difference is mainly explained by the normative rule of national accounts, which is found in the DNAs, which consists in viewing public deficits as needing to be paid back one day and therefore not viewing aid financed by deficit as real income. The other source of difference is retained earnings, which are also highly volatile. These phenomena are lessened by the valuation of free public services which help to cushion the effects of crises on primary inequalities, which they tend to increase.

Figure IX – **Real Feel GDP and Real Feel disposable income in France (1996-2020)**



Sources: World Bank. INSEE. World Inequality Lab. Author's calculations.

Box – **Real Feel GDP and Real Feel Disposable Income**

In practice, allocating 100% of GDP among households is a very demanding accounting exercise. The first complete DNA was published by INSEE in 2021 for the year 2018 (Accardo *et al.*, 2021). A new publication covers the year 2019 (André *et al.*, 2023).

Where complete DNAs are not available, simplification assumptions should be made. Thus, the DNAs of the World Inequality Lab, which cover a large number of countries and years, use two options for valuing public services. The first calculates them as proportional to disposable income. Both the work carried out by André *et al.* (2023) and the results of the OECD expert group (Zwijnenburg *et al.*, 2021) do not validate this normative assumption. In contrast, the second option, that of assigning an equal amount to all of them ($\sum_k q_i^k = Q/n$), seems to be a reasonable simplification, at least for approaches grouping together households by standard of living decile. The flat-rate option results in lower income inequalities after transfers than the proportional option.

As regards retained earnings, considering them to be an indirect form of household income is a debated issue. Those who defend this approach (Pikkety & Saez, 2003), following the approach used for national accounts, consider them to be reinvested earnings and treat them as if they were distributed and then reinvested. The opponents consider them to be earnings and recommend that they be accounted for only when they are actually distributed as dividends.

Our Real Feel GDP is based on a broader distribution of national income, and therefore incorporates them, but there is nothing to prevent the conceptual framework from adapting to a narrower notion of income. As an alternative to Real Feel GDP, we can look at two indices covering a greater or lesser part of national income, Real Feel Disposable Income (RFDIINC):

$$RFDIINC \equiv (1/n\sum_i m_i^{1-\hat{\tau}})^{1/(1-\hat{\tau})} \quad (4B)$$

or even Real Feel Adjusted Disposable Income (RFADIINC):

$$RFADIINC \equiv (1/n\sum_i \left(m_i + \sum_{k\in IND} q_i^k\right)^{1-\hat{\tau}})^{1/(1-\hat{\tau})} \quad (4C)$$

in which *IND* is the set of individualisable public services. In effect, national accounts separate collective consumption into so-called "individualisable" consumption – such as education, health or housing – and "non-individualisable" consumption such as police, justice, research, etc. The first group is called "social benefits in kind" and added to disposable income to calculate an "adjusted disposable income" of households. This intermediate form of distributed national accounts based on the notion of adjusted disposable income ($m_i + \sum_{k\in IND} q_i^k$) is produced on an experimental basis by an OECD expert group (EG-DNA, Zwijnenburg *et al.*, 2021). The next generation of national accounts, published in 2025, will include a new satellite account based on these accounts. RFADIINC could be a summary indicator consistent with this partial approach.

lower than growth as measured by GDP (+0.5% *versus* +2.7%). The difference is considerable, even after taking into account population growth: while income per capita rose, in euro at the 2019 exchange rate, from €25,600 to €50,900, our monetary well-being indicator rose from €23,800 to only €28,400 (Table 6).

This situation contrasts with that of European countries: despite lower GDP growth (1.9% per year), Real Feel GDP grew twice as fast (1% per year), rising from €17,100 to €24,800. Population growth is slower in Europe (0.5% per year compared to 1.0% in the USA) and explains part of the GDP growth gap, but this difference is corrected if GDP or NNI per capita is taken into consideration. Above all, inequalities have jumped in the USA, where the Atkinson inequality index rose from 36.3 points in 1980 to 58.2 points in 2019, an increase that is not found, or not to such an extent, in Europe, where it rose from 31.6 points to 32.9 points (cf. Table 5).

In net national income per capita in 2019, the USA appears to be 70% richer than European countries (€30,100 compared to €50,900), but the gap is only 14% (€24,800 compared to €28,400) in terms of monetary well-being. In Europe, the northern countries, with Denmark and Sweden leading the way, are in the top spots, combining a high NNI per capita with low inequalities. Despite slower growth, some countries such as France, Finland, Belgium and Sweden, which were behind the USA in the 1980s, are now ahead. Italy has performed worst in terms of growth (−0.1% per year), combining weak GDP growth performance and a rapid rise in inequalities.

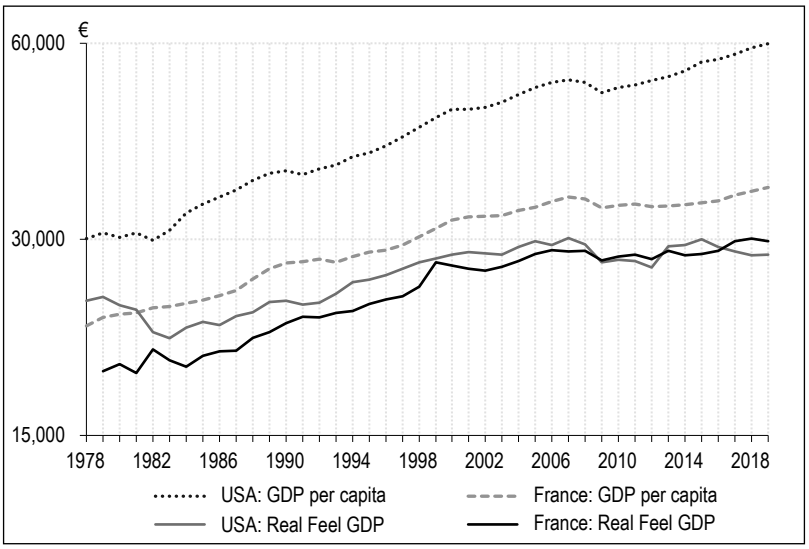
In 1978, GDP per capita was €22,000 in France and €30,000 in the USA, a gap of 36% in favour of the latter (Figure X); 40 years later, in 2019, the gap had widened further to 66% (€35,000 compared to €60,000). In terms of Real Feel GDP, on the other hand, the gap narrowed to the point of reversing the ranking between the two countries: €25,000 for the USA compared to €17,000 for France in 1978, €30,000 for France compared to €28,000 for the USA in 2019. In particular, the gap narrowed in the post-oil crisis period with the rapid rise in inequalities in the USA and in the 1997-1999 period in France.

Table 6 – **From GDP to Real Feel GDP in Europe and the USA**

	Real Feel GDP (%)	GDP growth (%)	NNI per capita growth (%)	Real Feel GDP	Real Feel GDP	NNI per capita	NNI per capita	NNI per adult
Year	1980-2019	1980-2019	1980-2019	2019	1980	2019	1980	2019
USA	0.5	2.7	1.8	28,393	23,763	50,878	25,580	67,892
Europe(*)	1.0	1.9	1.3	24,779	17,115	30,098	18,107	37,712
Belgium	2.1	1.9	1.4	31,072	13,626	34,629	20,447	44,722
Czechia	0.5	1.3	1.1	16,627	13,696	16,149	10,458	20,268
Denmark	1.3	2.0	1.7	45,098	27,009	47,975	24,615	61,829
Finland	1.3	2.1	1.6	35,157	20,845	36,258	19,251	46,041
France	1.1	1.7	1.1	29,826	19,287	31,249	20,461	39,677
Germany	0.6	1.9	1.0	26,566	21,310	34,978	23,621	42,720
Greece	0.6	0.8	0.3	8,938	7,025	14,563	12,724	17,901
Italy	−0.1	1.1	0.8	16,232	16,989	23,524	17,289	51,613
Netherlands	0.6	1.8	1.2	34,890	27,662	40,375	25,128	51,613
Portugal	0.9	2.1	1.9	12,045	8,615	17,140	8,254	21,016
Spain	1.1	2.4	1.8	14,587	9,686	22,546	11,455	27,962
Sweden	1.9	2.5	2.0	41,246	19,601	41,421	18,802	52,253
Switzerland	0.7	1.9	0.9	37,626	28,655	56,221	39,253	70,206
United Kingdom	1.7	2.5	2.0	27,815	14,430	30,259	13,769	39,438

(*) Europe: The 14 countries listed in the table.
Sources: For Real Feel GDP: author's calculations; for GDP growth, NNI per capita and NNI per capita growth: World Bank; for NNI per adult: WIL.

Figure X – **France-USA comparison over the period 1979-2019**



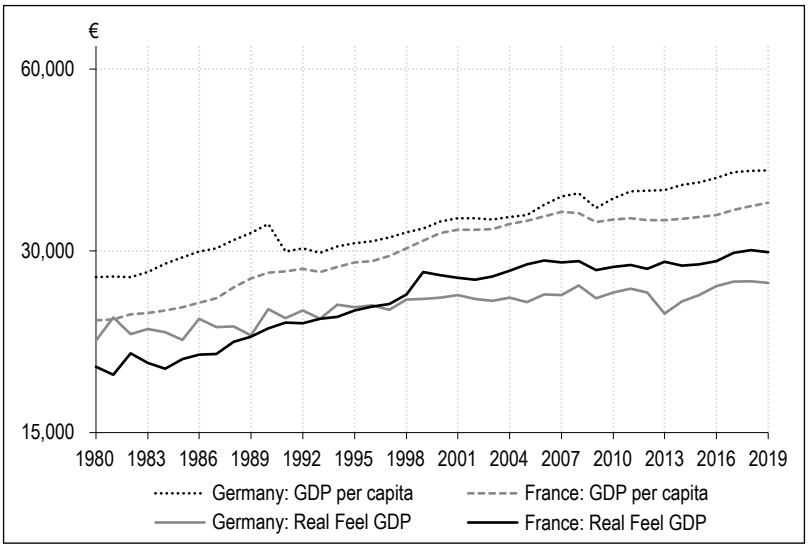
Sources: World Bank. World Inequality Lab. Author's calculations.

While France and Germany have experienced similar development in terms of GDP per capita over the last 40 years, with a contraction until the 2000s and an expansion thereafter, the situation in both countries is reversed in terms of Real Feel growth at the end of the 1990s (Figure XI): Real Feel GDP in France was 10% lower than in Germany at the beginning of the period (€19,300 compared to €21,300) and is almost 15% higher in France in 2019 (€29,800 and €26,600, respectively).

4.5. In Terms of Monetary Well-Being, Economic Crises Last Much Longer Than When Measured by GDP

Another interesting result for the guidance of economic policies concerns economic cycles, which appear to be very different, in terms of monetary well-being, from the results of the usual analysis of GDP. In particular, it takes much longer for a country to emerge from a recession in terms of monetary well-being than in terms of GDP. The following can be seen for the USA: after the second oil crisis, at the time

Figure XI – **France-Germany comparison over the period 1980-2019**



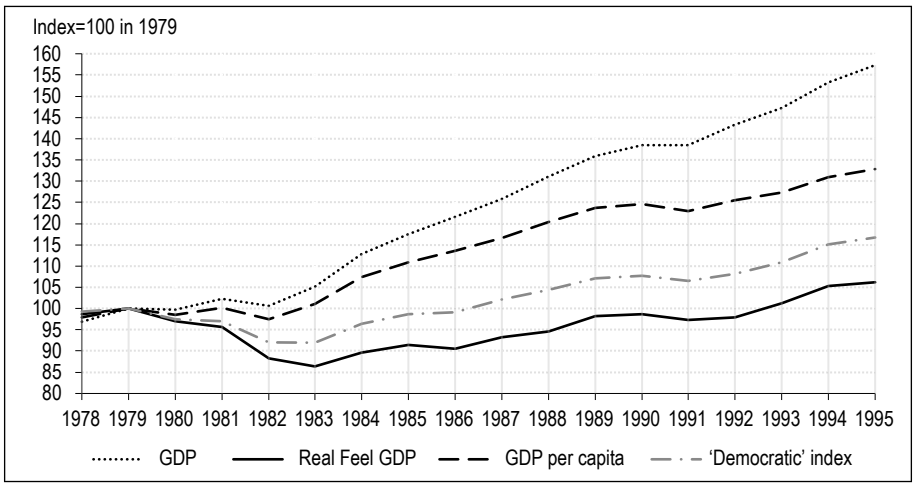
Sources: World Bank. World Inequality Lab. Author's calculations.

of the famous "double dip" of 1980 and 1982, it took a year for GDP to return to its pre-crisis level; in 1983, GDP was already 10% higher than in 1978. In contrast, ten years after the oil crisis, our Real Feel GDP indicator was still below its 1978 level (Figure XII).

The same phenomenon occurred after the 2007 crisis. In 2019, US Real Feel GDP was still 5% lower than its 2007 level, while GDP was 25% higher and GDP per capita was 14% higher in 2015 than in 2007. In France, while GDP was again on the rise in 2010 after the fall in 2009 and had returned to its pre-crisis level by 2013, it took another 6 years, making it 11 years in total, for Real Feel GDP to exceed its 2008 level (Figure XIII).

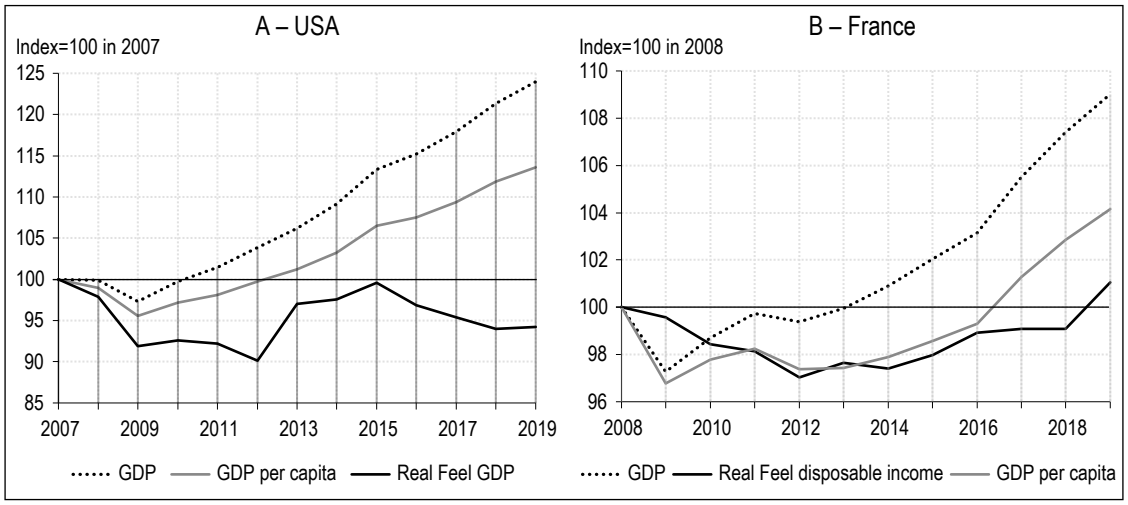
The USA recorded the second-best performance of our panel of countries in the 11 years following the Great Recession of 2007-2008, but fell to ninth place in terms of monetary well-being (cf. Table 6). While only Italy and Greece still have a GDP lower than in 2008, the pre-crisis level in terms of Real Feel GDP has not yet been reached, aside from for those two countries and the USA, in Spain, Finland and the Netherlands. In most cases, GDP has also largely underestimated the extent of the crisis in terms of monetary well-being. The lowest level in Greece was −41% in terms of Real Feel GDP compared to −32% in terms of GDP; however, the gap between the two indicators appears much more pronounced in other countries: −14.2%

Figure XII – **GDP and Real Feel GDP in the USA after the 1978 oil crisis**



Sources: World Bank. World Inequality Lab. INSEE. Author's calculations.

Figure XIII – **GDP and Real Feel GDP after the Great Recession of 2007-2008**



Sources: World Bank. World Inequality Lab. INSEE. Author's calculations.

Table 7 – **GDP and Real Feel GDP after the great recession of 2007-2008**

	Return to pre-crisis level*		Duration of the crisis* (years)		Extent of the crisis** (%)		Cumulative loss/ gain*** (%)		2019 compared to the pre-crisis level (%)	
	Real Feel GDP	GDP	Real Feel GDP	GDP	Real Feel GDP	GDP	Real Feel GDP	GDP	Real Feel GDP	GDP
Sweden	2011	2010	3	2	−5.8	−3.8	134	132	27	28
Czechia	2015	2014	7	6	−7.5	−4.7	44	58	23	21
Portugal	2016	2018	8	10	−1.1	−7.9	3	−32	12	5
France (WID)	2017	2014	9	6	−2.9	−2.7	−2	23	3	9
France (ERFS)	2019	2014	11	6	−3.0	−2.7	−16	23	1	9
Denmark	2017	2014	9	6	−5.8	−5.2	−24	33	2	15
Germany	2017	2011	9	3	−4.7	−5.7	−28	42	1	12
United Kingdom	2017	2013	9	5	−8.1	−5.7	−32	32	−2	12
Belgium	2018	2010	10	2	−8.6	−2.0	−40	68	3	15
USA	-	2012	>12	5	−8.1	−2.7	−55	85	−6	21
Finland	-	2017	>11	9	−8.3	−8.2	−63	−31	−4	4
Netherlands	-	2015	>11	7	−5.5	−3.8	−83	16	−7	10
Spain	-	2016	>11	8	−14.2	−7.8	−123	−16	−8	8
Italy	-	-	>11	>11	−8.8	−8.0	−147	−59	−14	−3
Greece	-	-	>11	>11	−41.0	−32.1	−310	−283	−32	−28

Notes: *End of the crisis = GDP or Real Feel GDP higher than pre-crisis level. **Difference between the lowest level and the pre-crisis level. ***2009-2019/pre-crisis level.
Sources: World Bank WIL. INSEE (ERFS). Author's calculations.

compared to −7.8% in Spain; −8.6% compared to −2% in Belgium; −8.1% in the USA compared to −2.7% (Table 7)

* *
*

As called for in 2009 by the Stiglitz-Sen-Fitoussi Commission on the measurement of growth, in this article we attempt to respond to the need for policymakers to have a summary indicator that could better reflect the improvement in well-being than GDP itself. Following in the tradition of previous work on equally distributed equivalent income, we define a monetary measurement of social well-being, Real Feel GDP, based on a monetary assessment of the satisfaction obtained through the distribution of income.

We call this new indicator "Real Feel GDP" by analogy with the Real Feel temperature used by meteorologists. Just as the temperature felt by the body may differ from the air temperature, GDP as felt by people may differ from the GDP depending on how it is distributed among the

population of a country and how it improves – or fails to improve – individuals' life satisfaction.

We paid a great deal of attention to estimating the link between income and life satisfaction using, for France, micro-data including, in addition to detailed information on the living conditions of households, an assessment by respondents of their life satisfaction. We also conducted numerous robustness checks, including cross-country analyses of 26 European countries or discrete choice models (see Online Appendix S4) and took care regarding the quality and historical depth of income distribution data. These come from INSEE and the World Inequality Lab over a long period, from the 1950s for the USA, the 1970s for France and the 1980s for other countries.

This new indicator sheds new light on the economic developments in Europe and the USA over the past 40 years. Indeed, while GDP has more than tripled in the USA since the 1970s, Real Feel GDP there is sluggish, which means that in terms of monetary well-being, the USA has been experiencing stagnation that has lasted for almost half a century. Meanwhile, in many other European countries, Real Feel GDP and GDP have developed in closer alignment, allowing Europe to catch up with the USA; or even overtake it, such as in the cases of France, Finland, Belgium or Sweden, despite slower GDP growth.

We also note that economic downturns lasted much longer than as measured by GDP: in the USA, monetary well-being took 10 years to return to its pre-crisis level after the second oil crisis. In 2019, 11 years after the 2008 crash, Real Feel national income was just returning to its pre-crisis level and had not yet returned to that level in countries such as the USA, Spain, Italy, and Greece.

To better examine the monetary aspects of well-being, we focused on the impact of income rather than the non-monetary dimension of quality of life. In this respect, our summary indicator is more of an "alongside" GDP type indicator rather than a "beyond" GDP type indicator. Our Real Feel GDP indicator thus goes farther than the "democratic growth" of Aitken & Weale (2020), taking into account the decreasing marginal utility of income, but without taking into account other dimensions, such as health as was done by Boarini *et al.* (2022), in order to avoid the delicate problems raised by the valuation, at the individual level, of a good state of health.

Nevertheless, there is no obstacle to extending our concept to other dimensions of well-being, as shown by exploring an extended version of our Real Feel GDP that takes into account unemployment (see Online Appendix S1). Introducing more dimensions raises the question of the availability of data with historical depth and a sufficiently broad panel of countries. This, in turn, shows the value of adopting a broader framework of international standards for national accounts than the current one (ONU, 2013) and the imperative need for the ongoing work to actually lead to the integration of distribution, health, education and leisure accounts. This is a critical step to progress towards the construction of summary indicators of monetary well-being, along the lines of the one proposed in this article. □

Link to the Online Appendix:
https://www.insee.fr/en/statistiques/fichier/7647298/ES539_Germain_Online-Appendix.pdf

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